REMARKS

This amendment is a first submission under 37 CFR §1.129(a) with this application meeting the requirements for such submission and the appropriate fee under 37 CFR §1.17(r) is also submitted herewith. Accordingly, the finality of the final rejection as set forth in the office Action dated August 25, 1999 is automatically withdrawn and consideration of the claims as amended is required.

By the above amendment, claims 24, 52 and 56 have been amended to define the meaning of "one fuel cycle" in accordance with the definition provided at page 15, line 33 to page 16, line 3 of the specification, referred to by the Examiner in the Office Action dated August 25, 1999, so as to avoid any question as to the meaning of "one fuel cycle". Additionally, the dependency of claim 29 has been corrected so as to properly depend from a claim present in this application. Further, new dependent claims 58-60 have been presented. Also, the specification at page 18 has been amended to correct an apparent error.

Turning to the amendment of the claims, applicants note that at pages 3 and 4 of the Office Action dated August 25, 1999, the Examiner indicates that applicants are incorrect regarding the meaning of a fuel cycle in terms of starting the reactor to shut down the nuclear reactor, and that as defined in the specification of the application, one fuel cycle is the operation period of a nuclear reactor from when the fuel and the reactor core is replaced and operation of the nuclear

reactor is started to when the nuclear reactor is stopped for renewing the fuel. Accordingly, to avoid any question of such proper meaning and avoid the possible meaning of shutting down the nuclear reactor for reasons other than for refueling, such as due to reactor scram, claims 24, 52 and 56 have been amended to define "one fuel cycle" as, which one fuel cycle is an operation period of the nuclear reactor from when fuel assemblies in the nuclear reactor are replaced and operation of the nuclear reactor is started to when the nuclear reactor is stopped for renewing at least one of the fuel assemblies", which represents a definition as recognized by the Examiner, such that the amendment does not raise new issues requiring further search and/or consideration.

As an example of the utilization of "fuel cycle", reference is made to U.S. Patent Nos. 4,280,874 and 4,285,769, which describe the exchanging of fuel assemblies at the end of a fuel cycle so that fuel assemblies of exposure for different fuel cycles are present in the core of the reactor. Copies of such patents are enclosed as an aid to the Examiner. Thus, "one fuel cycle" is representative of the first full cycle, the second fuel cycle, the third fuel cycle, etc. Applicants note that such patents were submitted with the Amendment filed January 27, 2000 which was not entered. However, since the patents are in the application file, further submission is considered unnecessary.

As to the rejection of claims 24, 50 under 35 U.S.C. §103(a) as being unpatentable over any of Japan 61256282,

Japan 0220686 or Japan 0031090, in view of Sofer; the rejection of claims 24, 26, 29, 40-43, 50, 52-57 under 35 U.S.C. §103(a) as being unpatentable over Patterson in view of Sofer taken with any of Japan 0220686, Japan 0031090 or Japan 61256282; the rejection of claims 24, 26, 29, 40-43, 50 and 52-57 under 35 U.S.C. §103(a) as being unpatentable over Matzner in view of Sofer and any of Japan 0220686, Japan 0031090 or Japan 61256282; the rejection of claims 24, 26, 29, 40-43, 50, 52-57 under 35 U.S.C. §103(a) as being unpatentable over Patterson et al in view of Sofer taken with any of Japan 0220686, Japan 0031090 or Japan 61256282 and further in view of applicants own admission of prior art in the specification; and the rejection of claims 24, 26, 29, 40-43, 50, 52-57 under 35 U.S.C. §103(a) as being unpatentable over any of Japan 61256282, Japan 0220686 or Japan 0031090 in view of Sofer and further in view of any of Matzner, Patterson et al or Kumpf; such rejections are traversed insofar as they are applicable to the present claims, and reconsideration and withdrawal of the rejections are respectfully requested.

Applicants note that a common thread in the rejections as set forth by the Examiner is the combination of references in relation to the rejection of claims 24 and 50 of Japan 61256282, Japan 0220686 or Japan 0031090 in view of Sofer, and such rejection will be initially discussed below.

In setting forth the rejection, the Examiner notes that the primary references, i.e. the cited Japan references, each show operating a nuclear reactor wherein the fuel assemblies

have at least one water rod in a manner such that the water rod has a steam void therein during a first part of the fuel cycle, and, is completely filled with water during a second part of the fuel cycle by increasing the coolant flow rate. The Examiner recognizes that in the primary references, "this change in flow by changing the size of an opening in the water rod".

Turning to Japan 0031090 and the translation provided by the Examiner, it is noted that Fig. 5 thereof shows an example of a core where the fuel is installed and the numbers 1-4 represent the numbers of the fuel cycle of the fuel assembly. That is, as described in the paragraph bridging pages 7 and 8 of the translation, the number 1 fuel in Fig. 5 is a fuel assembly which has passed through less than one cycle since installation and the numbers 2, 3 and 4 represent the fuel assembly having passed two fuel cycles, three fuel cycles and four fuel cycles, respectively. In this regard, a fuel cycle is defined in the manner set forth in the claims of this application. In accordance with the invention of this reference, the screws 14 as shown in Fig. 3, are present in the water rods in the numbers 1 and 2 fuel assemblies, i.e. fuel assemblies of first and second fuel cycles, while the screws 14 are removed from the water rods in the numbers 3 and 4 fuel assemblies. Thus, as shown in Fig. 6, the situation is that the water rods have the screws therein during the first and second fuel cycles and prior to initiation of the third fuel cycle and subsequent fuel cycles, the screws 14 are

removed from the water rods. As further described in the translation at page 7, when the screw 14 is present as in Fig. 3, the flow rate of the cooling water is low and the void ratio is thereby high whereas, oppositely, when the screw 14 is removed, the cooling water flow rate increases and the void ratio can become zero.

Based upon this disclosure, it is apparent that Japan 0031090 discloses that the coolant flow rate through the water rod during any one fuel cycle remains the same. That is, during the first and second fuel cycles, the screw 14 is present in the water rod and one flow rate is obtained which generates voids in the fuel rods, and before the third fuel cycle, the screw 14 is removed and another flow rate is obtained during the third and subsequent fuel cycles. As such, while the Examiner contends that Japan 0031090 discloses that "the water rod has a steam void therein during a first part of the fuel cycle, and, is completely filled with water during a second part of the fuel cycle" (emphasis added), this position is contrary to the disclosure of such reference, wherein a fuel cycle is represented as an operation period from when the fuel assemblies in the nuclear reactor are replaced and operation of the nuclear reactor is started to when the nuclear reactor is stopped for renewing at least one of the fuel assemblies. That is, the Examiner confuses the total operation cycle of the nuclear reactor with individual fuel cycles within the operation cycle. Thus, this reference fails to disclose or teach the features relied upon by the

Examiner and fails to disclose or teach the claimed invention in the sense of 35 U.S.C. §102 and 35 U.S.C. §103.

Turning to Japan 0220686 and the translation provided by the Examiner, applicants note that this reference like Japan 0031090, discloses a water rod having a removable screw. As described herein, the screw 11 as shown in Fig. 3 is present during first and second fuel cycles in accordance with the reactor core arrangement of Figs. 4 and 5, and the screw 11 is removed from the water rod for third and subsequent fuel cycles as illustrated in Fig. 5 and the corresponding description, as set forth in the first paragraph at page 8 of the translation. Further, as set forth in the last paragraph at page 7 of the translation, if there is a screw 11 in the water rod, the void ratio in the main body of the water rod will increase, whereas if the screw 11 is removed, the flow rate of the water coolant increases and therefore it is possible to bring the void ratio down to zero. Thus, hereagain, the Examiner has misinterpreted the disclosure of this reference in relation to fuel cycle, and the control of coolant flow during a period of the fuel cycle. As such, this reference also does not provide a disclosure or teaching of the present invention, irrespective of the position set forth by the Examiner and all claims patentably distinguish over this reference in the sense of 35 U.S.C. §102 and 35 U.S.C. §103. It is noted that this reference differs from Japan 0031090 in the positioning of the screw in that the screw 14 of Japan 0031090 is at the upper portion of the water rod,

whereas in Japan 0220686, the screw 11 is at the lower portion of the water rod.

Turning to Japan 61256282 and the translation provided, applicants note that applicants consider the translation to be inaccurate, in that fuel cycles are not properly described. Applicants note that Fig. 3 of this reference corresponds to Fig. 6 of Japan 0031090 and Fig. 3 of Japan 0220686, wherein the first and second cycles represent first and second fuel cycles, and the third cycle represents a third fuel cycle and subsequent fuel cycles in the conventional definition of a fuel cycle. Thus, while the Examiner has referred to a first part of the fuel cycle and a second part of the fuel cycle, such is more properly representative of a first stage of operation including first and second fuel cycles, and a second stage of operation including third and subsequent fuel cycles. Hereagain, in this reference, the control of the inlet opening of the water rod is changed from a small inlet opening in the first and second fuel cycles to a larger inlet opening in the third and subsequent fuel cycles by rotation of the water rod by 90 degrees in the manner described. Thus, this reference like the other Japanese references, does not disclose or teach, contrary to the position set forth by the Examiner, that the water rod has a steam void therein during "a first part of the fuel cycle, and, is completely filled with water during a second part of the fuel cycle", but rather that the water rod has a steam void therein during first and second fuel cycles, and is completely filled with water during third

and subsequent fuel cycles. Thus, the claims of this application also patentably distinguish over this reference in the sense of 35 U.S.C. §102 and 35 U.S.C. §103.

For the above noted reasons, applicants submit that Japan 61256282, Japan 0220686 and Japan 0031090 do not disclose the features contended to be present by the Examiner, and with respect to claim 24, for example, fails to disclose or teach raising a coolant surface formed between the coolant and a vapor in the at least one water rod during one period from a beginning of one fuel cycle, which one fuel cycle is an operation period of the nuclear reactor from when fuel assemblies in the nuclear reactor are replaced and operation of the nuclear reactor is started to when the nuclear reactor is stopped for renewing at least one of the fuel assemblies, and before an end of the one fuel cycle, and further increasing the flow rate of coolant supplied to the core during another period after the one period to an end of the one fuel cycle in a state in which the at least one water rod is completely filled with the coolant, it being noted that corresponding features are recited in other independent and dependent claims of this application. Thus, applicants submit that all claims present in this application patentably distinguish over these references in the sense of 35 U.S.C. §102 and 35 U.S.C. §103.

The Examiner has recognized that the claims of this application also recite the feature of a pump which regulates a flow rate of coolant supplied to the core, and the manner in

which the raising of the coolant surface formed between the coolant and the vapor in the at least one water rod is effected by increasing the flow rate of the coolant supplied to the core is "based on increasing a number of revolutions of the pump during one period from a beginning of one fuel cycle...and before an end of the one fuel cycle" and based on increasing the number of revolutions of the pump during another period after the one period to an end of the one fuel cycle". The Examiner recognizes that the cited Japanese references do not disclose or teach the use of a pump and the regulation as defined by increasing the revolutions of the pump, therefore the Examiner refers to the patent to Sofer, while contending that "it was also a known alternative in this art that this necessary change in flow rate could also be accomplished by changing the flow rate at which the coolant is recirculated in the reactor system (as shown for example by Sofer) and, to so modify any of the primary references would accordingly have been prima facie obvious". Applicants submit that this position by the Examiner represents a hindsight reconstruction attempt of the present invention utilizing the principle of "obvious to try" which is not the standard of 35 U.S.C. §103.

Turning to Sofer, applicants note that while this patent does disclose the use of a recirculating feed water pump 146, for a boiling water reactor, it is readily apparent that Sofer does not disclose or teach the use of a water rod and control of the flow of coolant through a water rod. More

particularly, this patent discloses that water is recirculated through the channels of a fuel assemblies and around the fuel rods thereof. In accordance with Sofer, the reactor started with the minimum recirculating rate required to maintain the required margins and then after it has become necessary to withdraw all control rods to maintain the desired output and the power level begins to drop, the water recirculation rate is increased between 10 and 30%. Clearly, there is no disclosure or teaching in Sofer of utilizing a water rod and the raising of a coolant surface formed between the coolant and a vapor in the at least one water rod by increasing the flow rate of the coolant supplied to the core based on increasing a number of revolutions of the pump, during one period from a beginning of one fuel cycle and before an end of the one fuel cycle, and further increasing the flow rate of the coolant supplied to the core based on increasing the number of revolutions of the pump during another period after the one period to an end of the one fuel cycle in a state in which the at least one water rod is completely filled with coolant, as recited in claim 24, for example. Applicants further note that Sofer has an issue date of 1975 and each of the Japanese references have Japanese filing dates in the early 1980s, so that it is assumed that the inventors of the Japanese references were well aware of the utilization of a recirculating pump, but specifically provided other means for controlling coolant flow in the water rod which coolant flow was controlled in the same manner during any one fuel cycle.

It is thus apparent that the proposed combination represents a hindsight reconstruction attempt in complete disregard of the teachings of the individual references. Applicants further note that claims 53 and 57 recite the feature that the step of raising the coolant surface includes increasing the flow rate of the coolant in the range of 0% to less than 110% of the flow rate during the one period and the step of further increasing the flow rate of the coolant includes the increasing the flow rate above 110% of the flow during the another period and clearly, such feature is not disclosed by Sofer or the other cited art.

Reference is made to the decision of In re Fine, 5 USPQ 2d 1596 (Fed. Cir. 1988), wherein the court pointed out that the PTO has the burden under §103 to establish a prima facie case of obviousness and can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. As noted by the court, whether a particular combination might be "obvious to try" is not a legitimate test of patentability and obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. As further noted by the court, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. Furthermore, reference is

made to the decision of In re Fritch, 23 USPQ 2d 1780 (Fed. Cir. 1992), wherein the court stated that the "mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification."

For the foregoing reasons, applicants submit that the combination of any of the cited Japanese references with Sofer is improper and that all claims patentably distinguish thereover in the sense of 35 U.S.C. §103, such that all claims should be considered allowable at this time.

With regard to the aforementioned combination of Sofer and the Japanese references with Patterson et al, Matzner, applicants own admission of prior art in the specification and/or Kumpf, applicants submit that the additional cited art and applicants so-called admission further represent the hindsight reconstruction analysis utilized by the Examiner which is improper.

With respect to Patterson et al, while this patent discloses a water rod of particular construction, Patterson et al does not disclose or teach the features of the present invention related to raising a coolant surface formed between the coolant and vapor in the at least one water rod by increasing the flow rate based upon increase of revolutions of a pump during one period of one fuel cycle before the end of the one fuel cycle and then increasing the flow rate during another period after the one period to the end of the one fuel cycle in a state in which the at least one water rod is

completely filled with coolant. Applicants further note that in Patterson et al, the coolant delivery port of the coolant descending path is provided so as to cool a critical heat transfer zone of the fuel rods are cooled by sub-cooled water jetted from the coolant delivery port in order to prevent damage of the fuel rods and applicants submit that in Patterson et al, if a coolant surface is formed in the coolant descending path, vapor is jetted from the coolant delivery port and the critical heat transfer zone of the fuel rods is not cooled by the vapors, such that the temperature of the critical heat transfer zone would rise and it is apparent that such is not the intent of Patterson et al and represents a hindsight reconstruction attempt by the Examiner. Moreover, the utilization of the water rod of Patterson et al is contrary to the disclosure of the Japanese references which utilize screws or other flow control during a particular fuel cycle and recognizing that Sofer does not disclose a water rod, again representing a hindsight reconstruction attempt. Thus, applicants submit that all claims patentably distinguish over this proposed combination of references in the sense of 35 U.S.C. §103.

Turning to Matzner, applicants submit that hereagain, irrespective of the comments by the Examiner, Matzner does not overcome the deficiency of the other cited art in relation to raising of the coolant surface during one period in the manner defined nor the increasing the coolant flow rate to provide a state in which the water rod is completely filled with coolant

during the another period of the one fuel cycle after the one period in the manner set forth. Thus, applicants submit that hereagain, the Examiner has engaged in a hindsight reconstruction attempt in complete disregard of the teachings of the individual references, and all claims patentably distinguish over this proposed combination of references.

As to Kumpf, it is noted that this patent discloses a U-shaped tube 32, but the proposed combination with the other cited art is not understood, other than by hindsight reconstruction. Furthermore, applicants submit that Kumpf, taken alone or any combination with any of the other cited art, fails to disclose that a coolant surface between the coolant and the vapor forms in the U-shaped tube and the control in the manner recited in the claims of this application. Thus, applicants submit that all claims present in this application patentably distinguish over this proposed combination of references.

With respect to newly added dependent claims 58-60, such claims more particularly define the structural arrangement of the water rod setting forth the requirement that all of the coolant supplied into the coolant ascending path is introduced coolant descending path in a downward direction opposite to the direction of the flow of the coolant in the coolant descending path, with such features further distinguishing over the cited art. Accordingly, these claims should also be considered allowable at this time.

In view of the above amendments and remarks, applicants

submit that all claims present in this application should now be in condition for allowance, and issuance of an action of a favorable nature is courteously solicited.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (501.25507CX5) and please credit any excess fees to such deposit account.

Respectfully submitted,

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